<u>CLAIMS</u>:

1.   A method to perform channel estimation, comprising:

receiving a first training sequence;

estimating a maximum likelihood estimate of a channel impulse response using said first received training sequence;

receiving a second training sequence; and

estimating at least one channel impulse response estimate using said maximum likelihood estimate and said second received training sequence.

2.   The method of claim 1, wherein estimating said maximum likelihood estimate comprises:

filtering said first received training sequence using a filter matched to said first received training sequence to form a first set of vectors for a matrix; and

transforming said matrix to form said maximum likelihood estimate.

3.   The method of claim 1, wherein estimating said channel impulse response estimate comprises:

receiving said maximum likelihood estimate;

generating a set of threshold values using said maximum likelihood estimate;

generating a set of candidate channel impulse response estimate vectors using said threshold values; and

selecting said channel impulse response estimate from said candidate channel impulse response estimate vectors.

4.   The method of claim 3, wherein generating said set of threshold values solves the following equation:

$$t_j = \frac{\max\limits_{k=0,L-1}\left|\hat{h}_k^{ML}\right|}{N} j$$

where $\mathbf{t} = [t_1,...,t_N]$ is a set of thresholds, $j = 1,...,N$, L represents a channel impulse response length, $\hat{\mathbf{h}}^{ML}$ represents said maximum likelihood estimate, $\hat{h}_k^{ML}$ represents the k-th tap of maximum likelihood estimate of said channel impulse response, and $k = 0,...,L-1$.

5.   The method of claim 3, wherein generating said set of candidate channel impulse response estimate vectors solves the following equation:

$$\hat{h}_k^{(j)} = \begin{cases} \hat{h}_k^{ML}, & \text{if } \left|\hat{h}_k^{ML}\right| \geq t_j \\ 0, & \text{if } \left|\hat{h}_k^{ML}\right| < t_j \end{cases}$$

where $\hat{\mathbf{h}}^{(j)} = [\hat{\mathbf{h}}^{(1)},...,\hat{\mathbf{h}}^{(N)}]$ is a set of candidate channel impulse response estimates, $j = 1,...,N$, $\hat{h}_k^{(j)}$ is k-th tap of j-th candidate channel impulse response estimate vectors, $\mathbf{t} = [t_1,...,t_N]$ is a set of thresholds, and $\hat{\mathbf{h}}^{ML}$ represents said maximum likelihood estimate.

6.   The method of claim 3, wherein said selecting comprises:

filtering said first received training sequence using said candidate channel impulse response estimate vectors to form a second set of vectors;

determining a set of distance values between said second set of vectors and said second received training sequence;

selecting a minimum distance value from said set of distance values; and

selecting said channel impulse response estimate vector using said minimum distance value.

7.   The method of claim 1, further comprising:

receiving said channel impulse response estimate at a crosstalk filtering module to form a channel impulse response matrix;

creating a crosstalk suppression filter matrix based on said channel impulse response matrix; and

filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce crosstalk between said data streams using said crosstalk suppression filter matrix.

8.   A system, comprising:

a maximum likelihood estimator to generate a maximum likelihood estimate using a first received training sequence; and

a channel tap estimator to couple to said maximum likelihood estimator, said channel tap estimator to receive said maximum likelihood estimate and a second received training sequence, said channel tap estimator to generate at least one channel impulse response estimate using said maximum likelihood estimate and said second received training sequence.

9.   The system of claim 8, wherein said maximum likelihood estimator comprises:

a filter to receive said first received training sequence, said filter to filter said first received training sequence to form a first set of vectors for a matrix; and

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a matrix transformer to transform said matrix to form said maximum likelihood estimate.

10. The system of claim 8, wherein said channel tap estimator comprises:

a threshold generator to receive said maximum likelihood estimate and generate a set of threshold values using said maximum likelihood estimate;

a candidate channel impulse response generator to receive said threshold values, and to generate a set of candidate channel impulse response estimate vectors using said threshold values; and

a channel impulse response selector to receive said candidate channel impulse response estimate vectors and a minimum distance value, said channel impulse response selector to use said candidate channel impulse response estimate vectors and said minimum distance value to select said channel impulse response estimate.

11. The system of claim 8, further comprising:

a filter to receive said first received training sequence and said candidate channel impulse response estimate vectors, said filter to filter said first received training sequence using said candidate channel impulse response estimate vectors to form a second set of vectors;

a distance calculator to receive a second training sequence and said second set of vectors, said distance calculator to determine a set of distance values between said second set of vectors and said second received training sequence; and

a minimum selector to receive said distance values and select a minimum distance value from said set of distance values, and output said minimum distance value to said channel impulse response selector.

12.   The system of claim 8, further comprising:

a communications medium;

a plurality of transmitters to connect to said communications medium, with each

transmitter to transmit a data stream over said communications medium using a

communications channel;

a plurality of receivers to connect to said communications medium, said plurality

of receivers to receive said data streams from said communications channel; and

a crosstalk filtering module to connect to said plurality of receivers, said

crosstalk filtering module to receive said channel impulse response estimate and use

said channel impulse response estimate to filter said data streams to reduce crosstalk

signals incurred by said data streams during said transmission.

13.   The system of claim 12, further comprising a plurality of equalizers to connect

to said filtering module, said equalizers to equalize said filtered data streams using a set

of substantially similar equalization parameters.

14.   The system of claim 12, wherein said crosstalk filtering module comprises:

a channel impulse response matrix generator to generate a channel impulse

response matrix;

a crosstalk suppression filter matrix generator to generate a crosstalk suppression

filter matrix using said channel impulse response matrix; and

a filter to filter said data streams using said crosstalk suppression filter matrix.

15.   An article comprising:

a storage medium;

said storage medium including stored instructions that, when executed by a processor, result in performing channel estimation by receiving a first training sequence, estimating a maximum likelihood estimate of a channel impulse response using said first received training sequence, receiving a second training sequence, and estimating at least one channel impulse response estimate using said maximum likelihood estimate and said second received training sequence.

16.   The article of claim 15, wherein the stored instructions, when executed by a processor, further result in estimating said maximum likelihood estimate by filtering said first received training sequence using a filter matched to said first received training sequence to form a first set of vectors for a matrix, and transforming said matrix to form said maximum likelihood estimate.

17.   The article of claim 15, wherein the stored instructions, when executed by a processor, further result in estimating said channel impulse response estimate by receiving said maximum likelihood estimate, generating a set of threshold values using said maximum likelihood estimate, generating a set of candidate channel impulse response estimate vectors using said threshold values, and selecting said channel impulse response estimate from said candidate channel impulse response estimate vectors.

18.   The article of claim 17, wherein the stored instructions, when executed by a processor, further result in said selecting by filtering said first received training sequence using said candidate channel impulse response estimate vectors to form a

second set of vectors, determining a set of distance values between said second set of vectors and said second received training sequence, selecting a minimum distance value from said set of distance values, and selecting said channel impulse response estimate vector using said minimum distance value.

19.   The article of claim 15, wherein the stored instructions, when executed by a processor, further result in receiving said channel impulse response estimate at a crosstalk filtering module to form a channel impulse response matrix, creating a crosstalk suppression filter matrix based on said channel impulse response matrix, and filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce crosstalk between said data streams using said crosstalk suppression filter matrix.

20.   The method of claim 1, further comprising:

estimating a second maximum likelihood estimate of a channel impulse response using said second received training sequence;

estimating a second channel impulse response estimate using said second maximum likelihood estimate and said first received training sequence; and

averaging said channel impulse response estimates to find an averaged channel impulse response estimate.

21.   The method of claim 1, further comprising:

receiving an i-th training sequence;

estimating an M channel impulse response estimate using said i-th training sequence; and

averaging said M channel impulse response estimates to find an averaged channel impulse response estimate.